Near Detector Site Review

May 1, 2007

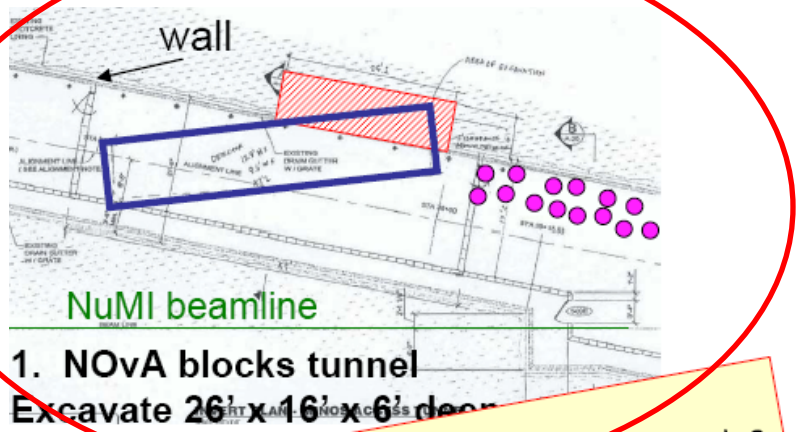
- As part of our normal and ongoing Engineering Design Review and Risk Management Program, we conducted an informal internal review of the excavation options for the NOνA Near Detector on April 27, 2007.
- Reviewers:
  - Elaine McCluskey
  - Chris Laughton
  - Steve Dixon
  - Tim Trout
  - Mike Andrews

Relevant Questions

- How much does it cost? How much confidence do we have in the cost estimate?
- How long does it take? How does it impact timing and duration of shutdowns?
- Physics impact?
- Does it have to be moved out of the way?
  - How hard is it to move?
  - How long does it take?
  - How much lead time is required?
  - How do we preserve secondary containment during the move?
  - How do we store the scintillator?

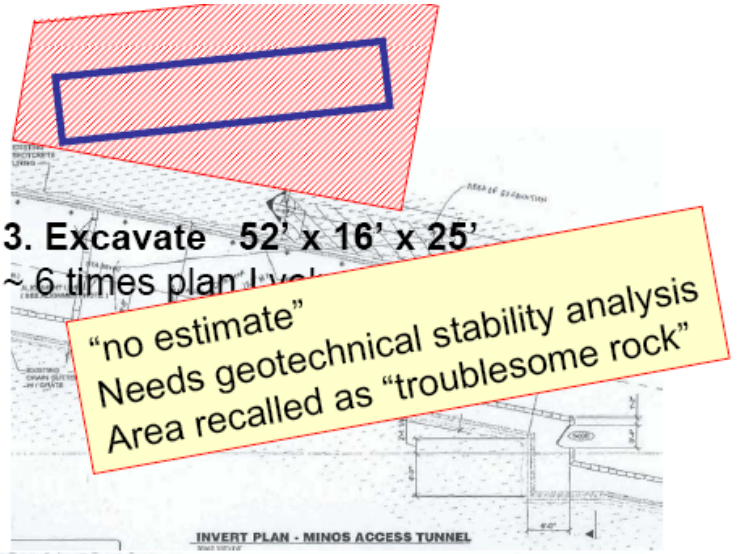
Various Options

Some not shown here



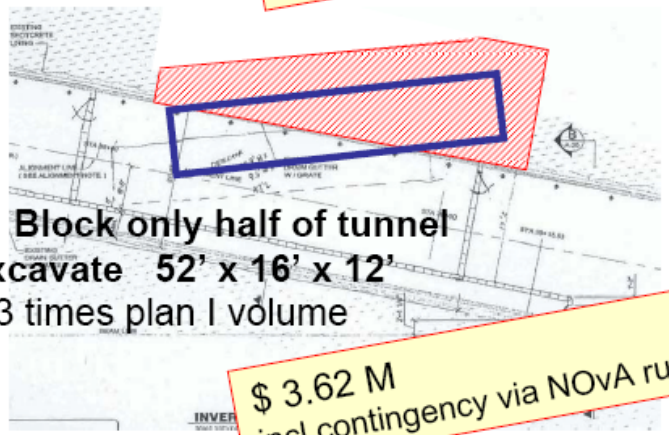
1. NOvA blocks tunnel
Excavate 26' x 16' x 6' deep

$ 1.25 M
incl contingency via NOvA rules



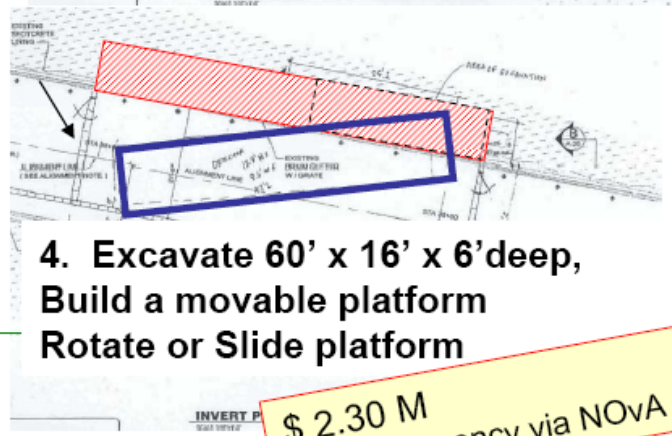
3. Excavate 52' x 16' x 25'
~ 6 times plan I vol

"no estimate"
Needs geotechnical stability analysis
Area recalled as "troublesome rock"



2. Block only half of tunnel
Excavate 52' x 16' x 12'
~ 3 times plan I volume

$ 3.62 M
incl contingency via NOvA rules



4. Excavate 60' x 16' x 6'deep,
Build a movable platform
Rotate or Slide platform

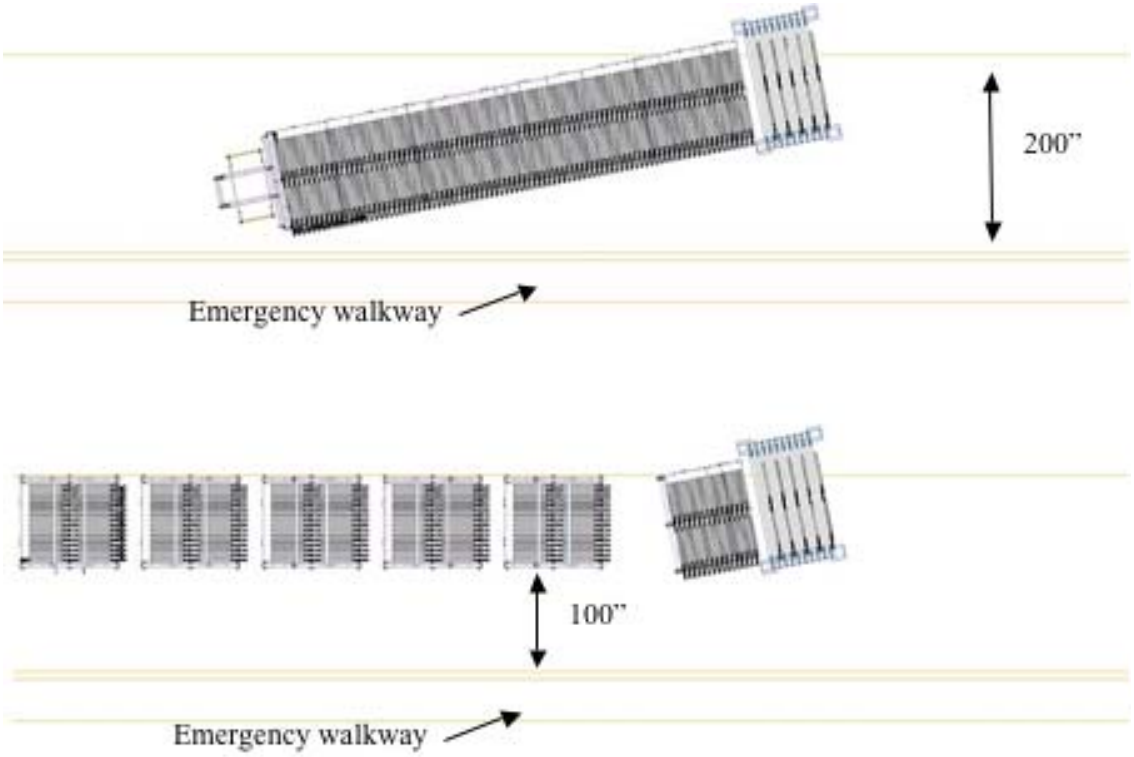
$ 2.30 M
incl contingency via NOvA rules

Minimal Excavation Option

There are a number of features associated with the minimal excavation option that are troublesome.

- Enclosed volume for fire suppression requires walls, doors, etc.
- Detector must be movable to free up access through half of MINOS tunnel.
  - Detector must be drained before moving.
  - Scintillator must be stored
    - Hundreds of 55 gallon drums
    - Under floor storage tanks
- Detector move must not compromise secondary containment when the detector is reassembled
- More electrical and plumbing disconnects in order to move detector.

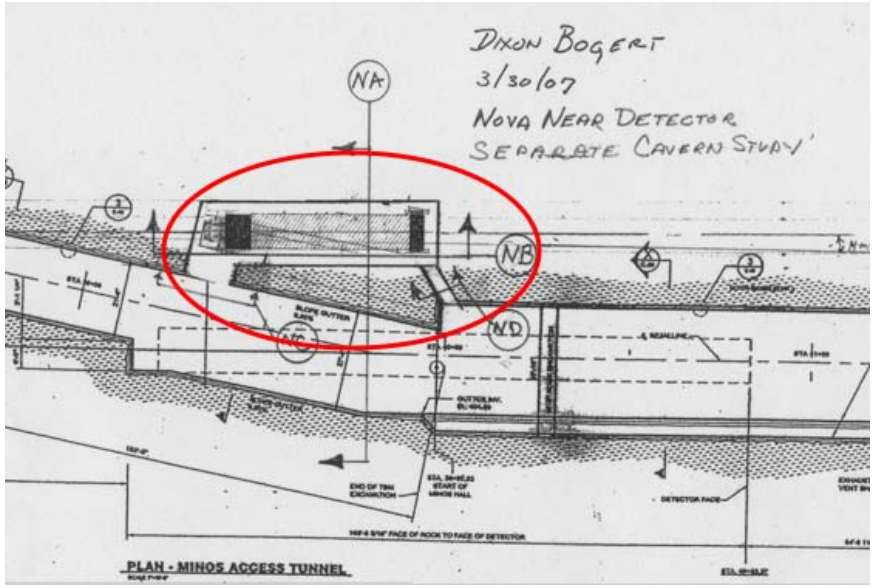
Moving the Near Detector



New Proposal

Proposal for new cavern adjacent to the MINOS tunnel. Requires 735 yd^3 of excavation, compared to ~100 yd^3.

- Advantages:
  - Detector does not block the tunnel and never has to be moved or disassembled.
  - The minimal excavation increases the span of the tunnel. The new cavern does not.
  - Secondary containment is simplified.
  - Fire suppression enclosure simplified.
  - Excavation of side cavern is less of a disturbance to others in the MINOS tunnel.
- Disadvantages:
  - Costs more.



Cost

- The cost of the excavation is thought to be less than $1M.
- 3 rationality exercises were presented to support this estimate (NOvA-doc-1127).
- There are additional substantial costs associated with outfitting and infrastructure. Many of these are in common with other options.
- In the process of identifying these costs for the new cavern option, similar to what we have done for the minimal excavation option.

FERMILAB: FESS COST ESTIMATE

Project Title: NOvA Near Detector Tunnel Mods		Project No. 6-7-14	Status:	Date: 9/22/2006	Revision Date:
ITEM NO	DESCRIPTION OF WORK	QUANTITY	UNITS	UNIT COST	AMOUNT
01	GENERAL CONDITIONS $33,200				
	Mobilization w/crew for 5 days including training	5	day	$2,200.00	$11,000.00
	dumpsters	1	ls	$2,000.00	$2,000.00
	dust walls 2 men 3 days	48	hrs	$50.00	$2,400.00
	dust wall materials plywood/heruclite	1180	sf	$1.50	$1,800.00
	Demobilization/cleanup w/crew 5 days	5	day	$2,200.00	$11,000.00
	Temp power for Minos Hall	1	ls	$5,000.00	$5,000.00
02	DEMOLITION $6,100				
	Cut and pull back existing cables 2 men 1 day	16	hrs	$85.00	$1,400.00
	Remove existing conduits & unistrut racks 2 men 2 days	32	hrs	$85.00	$2,700.00
	Haul out demoed materials	1	ls	$2,000.00	$2,000.00
03	EXCAVATE & FINISH TUNNEL ALCOVE $94,200				
	Drill & blast alcove 25' l x 6' w x 18' h w/ crew 3 weeks	15	days	$2,500.00	$37,500.00
	crew = 1 blast foreman, 1 driller, 1 equip oper, 2 laborers				
	1 OH crane operator crawler drill, 1 air compressor, hose				
	Install rock bolts & gunite w/ crew one week	5	days	$2,500.00	$12,500.00
	Install concrete slab & trench drain w/ crew 3 days	3	days	$2,500.00	$7,500.00
	Rock hauling offsite	100	cy	$12.00	$1,200.00
	Forklift/bobcat in tunnel	15	da	$500.00	$7,500.00
	Manlift in tunnel for high access	15	da	$500.00	$7,500.00
	Blast mat rental assume 10 for 2 weeks	100	day	$50.00	$5,000.00
	Explosives	1	ls	$3,000.00	$3,000.00
	Gunite materials	1	ls	$2,500.00	$2,500.00
	Concrete floor/trench drain materials	1	ls	$5,000.00	$5,000.00
	Bolting materials	1	ls	$5,000.00	$5,000.00
04	WALLS & FINISHES $22,600				
	8" glazed cmu walls ea end of detector & parallel	880	sf	$12.00	$10,600.00
	2 prs double 4' x 10' doors hollow metal rated	4	ea	$2,000.00	$8,000.00
	scaffolding	1	ls	$2,000.00	$2,000.00
	fire caulking around piping/conduit	1	ls	$2,000.00	$2,000.00
05	MECHANICAL/ELECTRICAL $67,000				
	Install unistrut utility supports off ceiling of alcove 2 men 2 days	32	hrs	$85.00	$2,700.00
	Unistrut materials & equipment	1	ls	$2,500.00	$2,500.00
	Reinstall 500 MCM ground cable	200	lf	$10.00	$2,000.00
	1.25" conduit 50' long with connections to existing	50	lf	$15.00	$800.00
	Repull cables in 1.25" conduit	200	lf	$12.00	$2,400.00
	2-3" conduits 50' long with connections to existing	100	lf	$25.00	$2,500.00
	Controls cable & terminations				
	repull 2 fiberoptic trunk lines	400	lf	$1.00	$400.00
	repull CATV, FIRUS, telephone, other	800	lf	$1.00	$800.00

Summary

- Sense of Committee was that new cavern is the more attractive option.
- Concern about cost.
- NOνA Collaboration voiced support for excavation to accommodate Near Detector at correct angle to beam up to a cost of ~ half a kton of Far Detector mass ~ $4M.
- Excavation is entirely conceptual. Requires 100% contingency.
- After successful CD-2 review, when we can spend money on final designs, we will hire an outside firm to do an engineering design of the cavern to determine its real cost.